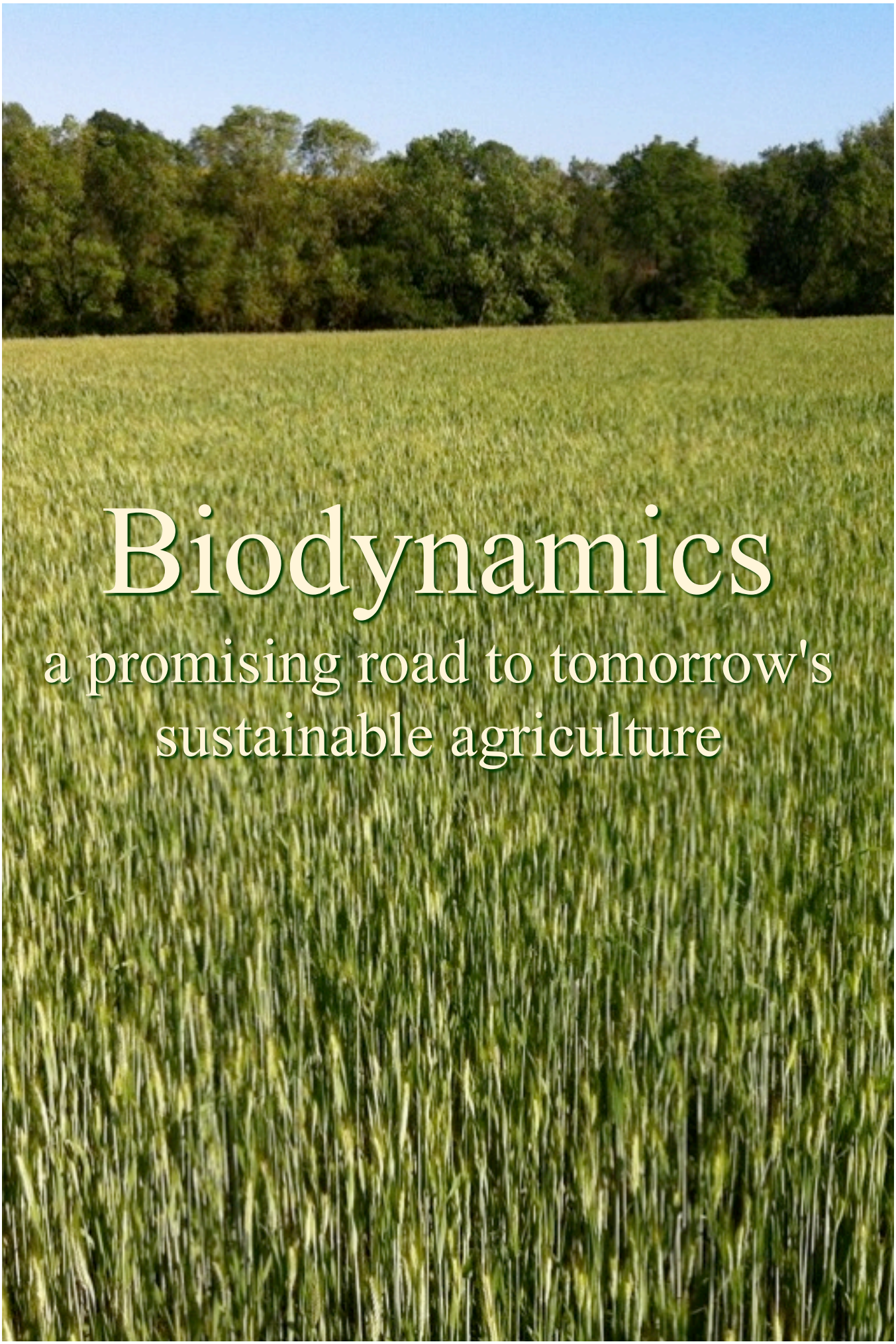
Biodynamics
a promising road to tomorrow's sustainable agriculture

Biodynamic Agriculture

In response to the insistent demands of a group of German farmers concerned with lowered food and fodder quality, diminished seed vigor and signs of degeneration in crops and livestock, Rudolf Steiner laid the foundation of biodynamic agriculture in an eight day course held in 1924. Proposing a wider and more in-depth view of nature, life and man, his approach assumes that all observable phenomena in our physical environment are in effect expressions of a much broader, immaterial reality which, from the Cosmic periphery, radiates towards Earth. According to this enlarged vision of the Universe, plants, animals, but also inert matter such as lime, silica, carbon, oxygen, hydrogen, nitrogen, potassium, phosphorous or sulphur are some sort of local condensation of a cosmic principle. In other words, they are not the root cause but merely the outward manifestation, the physical expression of a much broader reality.[1] To fully grasp and understand them, localized physicochemical analysis is not sufficient: just as it is essential to include the far away magnetic poles of our planet to understand the movement of a compass needle, we have to broaden the scope of our investigation - both in space and in time - to include spheres that are not readily accessible to our five senses. And we cannot choose to ignore them just because they cannot be measured directly using conventional instruments. In the world of life which modern science *«knows only by its symptoms»*[2] supra-sensible phenomena play a key role. Belonging to a realm which lies beyond the physical plane, they are a fundamental part of life and nature. Indeed, what a difference between a vigorously growing tree and a dead wooden pole, an animal bursting with vitality and a lifeless decaying body!

Rudolf Steiner, scientist, philosopher, visionary and inspirational source of various cultural, social, medical and educational initiatives, as well as founder of a school of thought called anthroposophy.

Broadening the scope of our scientific concepts

Blue underlined
Click
for additional
information

> It is premature to have wanted to reduce life processes
> to the insufficient physicochemical concepts
> of the nineteenth or even the twentieth century.
>
> Louis DE BROGLIE, Nobel Prize in Physics.

Biodynamics seeks to broaden our scientific concepts concerning both organic and conventional agriculture, considering that the mater-bound and mechanistic theories of modern science are way too narrow. Although highly sophisticated and powerful when dealing with inert matter and electromagnetic phenomena, they are far from giving us satisfactory insights into the world we live in. For a better understanding of the dynamic, interdependent and hierarchical

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[1] This point of view reminds us of the wave-particle duality in modern physics and of the way Quantum Physics deals with matter by attributing to each particle "a wave which, extending to infinity, has a mobile singularity of permanent existence" (Louis de Broglie), or of the morphogenic fields and morphic resonances postulated by Rupert Sheldrake and Emile Pinel (champs de forme or "form field").

[2] Albert Szent-Györgyi, Nobel Prize in Medicine and discoverer of vitamin C.

organization of Nature, we have to change our reductionist and simplistic view of the universe to include spheres related to Life and Consciousness. To fill this gap, biodynamics goes beyond the narrow frame work of conventional science and ads the notion of immaterial principle such as life force, formative force and rhythmic development to that of substance and physicochemical process; the notions of wholeness, homeostasis, coherence and symbiosis to that of mere analysis of individual parts; subjective aspects such as health, well-being, beauty, harmony, balance, taste, flavor and culinary enjoyment to those of easily measurable parameters. Only by adopting a broader vision of the world and by taking into account these more subtle criteria, can we hope to make progress in understanding Life and Nature which, holding secrets that are infinitely more complex than those governing the physical world, cannot be summed up nor understood based only on the infinitely small and on inert matter.

A holistic view which takes into account hidden aspects and subtle phenomena helps improve our insight and our choices with respect to running a farm. It also helps to better evaluate and apply the results of modern research and the empirical know-how of different farming systems including many traditional approaches.

Each Farm has its Unique Personality

The vision of a farm as an independent, living organism and integral part of the agricultural and social landscape leads inevitably to a new way of looking at farming methods, the farm setting and of course, the role of the farmer. Forests and wetlands, hedges and copses, flora and fauna, social and cultural aspects are all considered to be important parts of the farm organism and deserve similar attention as do fields and meadows, livestock and crops, orchards and beehives, machinery and economic factors. The farmer does not only think of himself as just a technical expert, but also as a keen observer – a kind of “Symphony conductor”, striving to establish harmony in the overall farming organism and to endow it progressively with its own unique personality.

Agricultural Practices that Respect Nature and Animals

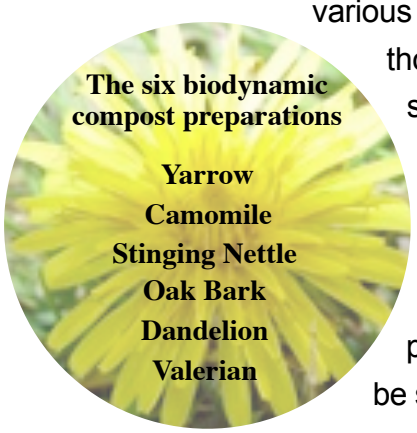
An enlarged view of nature taking into account supersensitive and cosmic influences creates a heightened sensitivity and respect towards the Living World and makes us aware of the strong ties that connect man to the plant and animal kingdoms.

Farm animals, the faithful companions and servants of man since the dawn of time, are at the heart of the farmer’s concerns. Their well-being is a top priority and he does his very best to nurture and protect them, making sure that their basic needs are met in a way that reflects respect and gratitude at all levels, including their bodily integrity: cattle keep their horns, pigs and sheep their tails and poultry their beaks. Cow horns, for example, are considered to be an important organ that contributes fully to the physiological health of this ruminant. By being linked to the digestive processes, they appear to have a beneficial influence on the nutritional and organoleptic qualities of milk, butter, cheese and meat.

The level of production is geared to the biological capacity of an animal. For most breeds of dairy cows, for example, an annual milk volume of 4 to 5,000 litres appears reasonable and makes it possible to feed them with mostly rough forage. This type of fodder, in particular if it has had the benefit of the biodynamic preparations, is ideally suited for their digestive system and promotes not only good health but also yields high-quality milk which, without the use of sophisticated technology, can be easily turned into a large variety of wholesome dairy products.

The Biodynamic Preparations

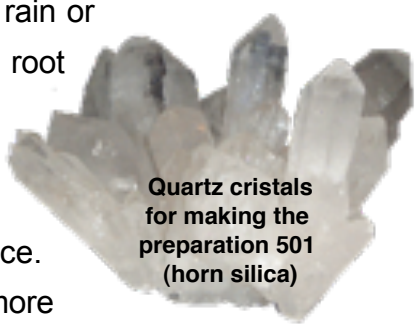
An enlarged view of Life and Nature has led to the elaboration and use of a series of catalytic substances known as the biodynamic preparations. By improving soil life and fertility they act on various essential processes at work in Nature, notably those related to key elements in agriculture, such as Silica, Lime, Potash, Phosphorus, Sodium, Nitrogen, Hydrogen, Oxygen, Carbon and Sulphur. These preparations are integrated into compost heaps to improve the quality of the fermentation process, or stirred in water (potentised) to be sprayed on the soil and on plants.



Preparation 500P (horn manure) made from cow dung

The various preparations which are derived from the plant, animal and mineral realms, specifically from quartz, cow manure and medicinal plants, stimulate the life and organisational forces of plants and soil and help compensate for imbalances between Earthly and Cosmic influences - climate shocks or a lack or excess of rain or sunshine, for example. By stimulating root development and soil life they also help improve soil structure, humus build-up (carbon sequestration) and a more harmonious plant-soil interface. This leads to better plant health and more nutritious crops featuring more subtle aromas, better taste and keeping qualities.[3]

Added to between 30 and 40 liters of water the preparation 500 (100 g/ha) and 501 (3 g/ha) are stirred for one hour and then sprayed on the soil (500) or on plants (501).



Quartz cristals for making the preparation 501 (horn silica)

Biodynamics also proposes a series of innovative methods and remedies that aim at reducing weeds and pests. In addition to the biodynamic preparations which already help in this respect, these include substances derived from these potential trouble makers as well as an attempt to organise the work schedule in harmony with solar, lunar and planetary influences.

The biodynamic preparations work most efficiently if they accompany good agricultural practices such as low till and no till cultivation techniques, minimum soil compaction by heavy machinery, sound crop rotation including companion cropping, cover crops and multi-species

[3] Appendix A contains numerous images showing typical biodynamic soil and plant development using horn manure (500P) and horn silica (501).

green manures and pastures. In addition, the presence of livestock on the farm, in particular a herd of cattle, is a great asset for achieving an optimum economical and ecological balance.

Soil Health and Fertility are the Key

"No activity, not even medicine,
is as important for our health as agriculture"

Pierre Delbet (1861-1957),
Member of the French Academy of Medicine

Using the term “medicinal plants”, obviously refers to disease and cure, two important notions in biodynamics which considers that the health of Mother Nature and of our soils has deteriorated to such an extent that they are unable to recover by themselves. Therefore, in order to survive and restore the vitality and fertility to our soils, Humanity has to acquire a new and more profound understanding of the laws governing Life and Nature. *Healthy and fertile soils are the basic foundation of any civilisation* and are of crucial importance to the good health of both plants and animals, the two pillars of the physical and emotional well-being of Man.

Australian Pasture *(see also page 11)* **: with the improved structure the soil gains in nitrogen and organic matter content** (*carbon sequestration*) **which in turn increases fertility** *(improved productivity and crop quality)*, **porosity** (*better air and water circulation*), **stability** (*less erosion*) **and water retention** (*less prone to drought and flooding*). **Between the soil on the right side image which has reached a high level of auto-fertility and the neighbors paddock on the left, the difference in carbon storage is more than 100 t/ha of C or more than 360 t/ha of CO_2. For just one hectare of well managed agricultural land this works out to the equivalent of *the annual CO_2 emissions of about 200 cars !***

A Better Balanced and More Self-Sufficient Farm Organism

Biodynamics tries to limit inputs from outside the farm by adopting cultivation, crop rotation and fertilisation techniques which promote a high level of soil life and soil fertility. Paired with an approach to livestock management and nutrition which respects the physical requirements and the well-being of animals, this leads to a well-balanced farm organism and a high degree of self-sufficiency. In addition, it protects the farm from all sorts of problems coming in from outside such as seed and fodder contamination, mad cow disease, hoof and mouth disease, bird flu, swine fever, etc.

Biodynamic Farming around the Globe

Biodynamics is the oldest consciously organic approach to farming and gardening, and possibly the most sustainable there is. Present on all five continents, it has influenced many of todays major organic movements. Starting out in Switzerland and Germany in the mid-twenties, its early development has been mainly in the German-speaking countries, Scandinavia and Australia. In 1947, Alex Podolinsky, one of the pioneers of Biodynamic farming, emigrated to Australia, a country known for its poor soil and difficult climatic conditions. Based on his work, biodynamics covers now around a million hectares with farms ranging in size from small market gardens with a few acres up to

large ranches covering in excess of 10.000 hectares. In a relatively short time soils which were worn out and compacted due to poor management have been turned into fertile pastures and crop land. Part of the crops harvested on these rejuvenated soils are exported to Japan and Europe where they are sought after by quality conscious buyers.

SEKEM in Egypte is another initiative where biodynamics plays a key role. Founded in 1979 by Ibrahim Abouleish, an Egyptian Medical Doctor and Chemist and the recipient of the 2003 Alternative Nobel Prize, this unique project unites cultural, social and economic initiatives and includes more than 2000 small farmers and several enterprises and partner organizations. SEKEM (www.sekem.com) has inspired many innovative projects around the globe sharing freely its experience and unique know-how.

This is farm owner and member of the Sekem cooperative

Demeter: World Wide Trade Mark for Biodynamic Products created in 1928

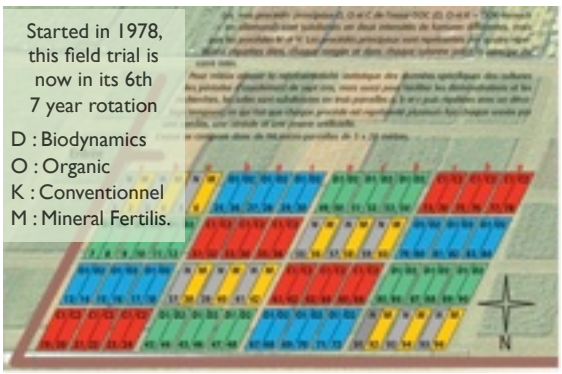
Precursor of the organic movement and first to clearly identify its products, biodynamic agriculture has created the Demeter Trade Mark named after the Greek Goddess of fertility. Conforming to the organic standards of the various host countries, its guide lines go considerably further and include additional criteria addressing farm organization, seed selection, animal care and the application of the various biodynamic preparations (see pages 3 & 4).

Especially in the German speaking countries and in Scandinavia, Demeter is well known. Enjoying an excellent reputation, prices for its products can be 20% or more above those for regular organics. The premium for bread wheat, e.g., is usually between 10 and 20%.

The Interest of Biodynamics Confirmed by Many Studies

"No one can deny the reality of a fact"

As surprising as it may seem to a Cartesian mind, biodynamics has amply demonstrated its effectiveness, the undeniable reality of cosmic influences and the often startling effects of small doses of its preparations on both soil conditions and on the development and health of plants (see Appendices A , B and C - pages 9, 17 and 18). Beyond clear evidence seen on farms or reported by scientists who have contributed to the development of this form of agriculture and gardening, the great value of the biodynamic approach is confirmed through numerous studies conducted by private and government backed organizations in several European Countries, North America and Australia.



In 1978 the Research Institute for Organic Agriculture in Frick, Switzerland (FiBL) has started a long-term comparison between biodynamic, organic and two modalities of conventional agriculture (DOK-Study). The study which is now conducted in partnership with the Federal Institute of Agroecology is laid out on a 4 hectare field with 96 subdivisions. Despite conventional

cultivation techniques and the tiny size of the plots, biodynamics comes out on top on many key parameters: higher organic matter content, lower acidity (higher pH), better soil structure and stability (lower tendency to erosion, compaction and crusting), a higher level of microbial and enzymatic activity, better root development and a greater presence and diversity of soil organisms. In addition, the biodynamic plots receiving only the biodynamic preparations but no fertilizer for over 20 years challenge the input-output theories of conventional agriculture (see Appendix B - page 17). Holistic analytical methods - including copper chloride crystallization and chromatography, designed to highlight organizational forces and the constitutional harmony of plants and agricultural products - led to a clear and reproducible distinction of biodynamic products (SCIENCE Vol 296 , 31 May 2002 : Soil fertility and Biodiversity in Organic Farming) .

Organic matter ties soil particles together resulting in a good and stable structure. In the spring when the soil is not yet completely covered with vegetation, the soils in the **DOK study** show a clear difference in structure and tendency to crusting, compaction and erosion. The difference in structure is particularly pronounced between the biodynamic plot (on the left) and the conventional/mineral plot (on the right).
Photos : Thomas Alföldi (FIBL)

Copper-chloride crystallization
red wine image from a biodynamic vineyard

Other studies show the positive effects of the biodynamic preparations on wheat germination (Hagel 1988), carbon dioxide absorption by plant leaves (photosynthesis effect -(König 1988), nutritional and keeping qualities of vegetables (Abele 1978 ; Elsaidi 1982). A recent study on the consumption of Demeter certified food in a German monastery showed an improvement in health parameters as well as in the physical and emotional well-being of the participants (Monastery Study K.Huber and al. 2005).

Biodynamic Agriculture in France

In France, where biodynamics is practiced on about a thousand farms, a multitude of associations and private organizations are involved in its development. Helped in part by the Australian impulse of Alex Podolinsky which brought a notable improvement in the effectiveness of the biodynamic preparations and the stirring equipment, its progress has accelerated considerably since the late 1990s. Thanks to the positive effects of biodynamics on soil improvement, the health of the grapevines as well as on the taste and authenticity of the wine (AOC), this approach to agriculture has acquired a certain prestige in viticulture where more and more vineyards, including some of the big names[4], have gone to biodynamics (see Appendix A - page 9). In an effort to promote

Photo
Romanée-Conti

[4] **Le Figaro** of 22-01-2013 : Mythe des mythes : la Romanée-Conti : The vineyard is organic since 1985 with 7 ha in biodynamics for a long time. Since 2007 all grapes are grown biodynamically without using this fact as a commercial argument, but because *'it results in a better wine'.* (*note*: Romanée-Conti is considered by many wine connoisseurs to be the Worlds top vineyard!)

Decanter Magazine (Internet issue October 13, 2014) ; Since last vintage, Roederer's Cristal and Cristal Rosé have been exclusively produced from biodynamic vineyards. - The house's chef de cave, Jean-Baptiste Lecaillon, said biodynamic methods 'add a pureness and extra vibrancy to the wines'. (*note* : Cristal de Roederer is considered by many experts as being the World's foremost Champagne.)

"authentic" wines which truly express local geological and climatic conditions, Nicolas Joly, owner of the famous "Clos de la Coulée de Serrant" and well known protagonist of biodynamics, set up "La Renaissance des Appellations" (Return-to-Terroir), an association which now includes more than 200 winegrowers from around the world.

Conclusions

Being interested not only in agronomical, ecological and economical issues but also in social and cultural aspects, biodynamics is uniquely positioned for making constructive contributions towards solving the problems which take center stage in todays debates on agriculture, food, health, environment and social issues: soil fertility – choice and safekeeping of seeds and cultivars – control of weeds, predators and crop diseases – animal well-being – food quality and conservation – food-health connection – social organization and the role of farmers in the food production process – economic and financial imbalances – preservation of our rural heritage – sustainable agriculture – carbon sequestration – climate change – droughts and floods – water shortages – energy and raw material waste – depletion of world's phosphate deposits – protection of the environment and natural resources, in particular biodiversity, agricultural land, water and air. Only through holistic approaches as they are proposed by biodynamics can we hope to come up with credible cures for the headaches, entanglements and dilemmas that keep haunting us.

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French version of this document : La Biodynamie : un chemin prometteur vers l'agriculture durable de demain

Internet Links

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18-10-2014

Appendix A : Impact of the Biodynamic Preparations

Soil cores from an Alsatian vineyard (Silica rich soil). Enlarge

Above : biodynamic soil **Below : adjacent conventional plot**

photo Pierre Masson 2003

Excerpt of the FIBL Science publication Science Vol 296 - May 31, 2002

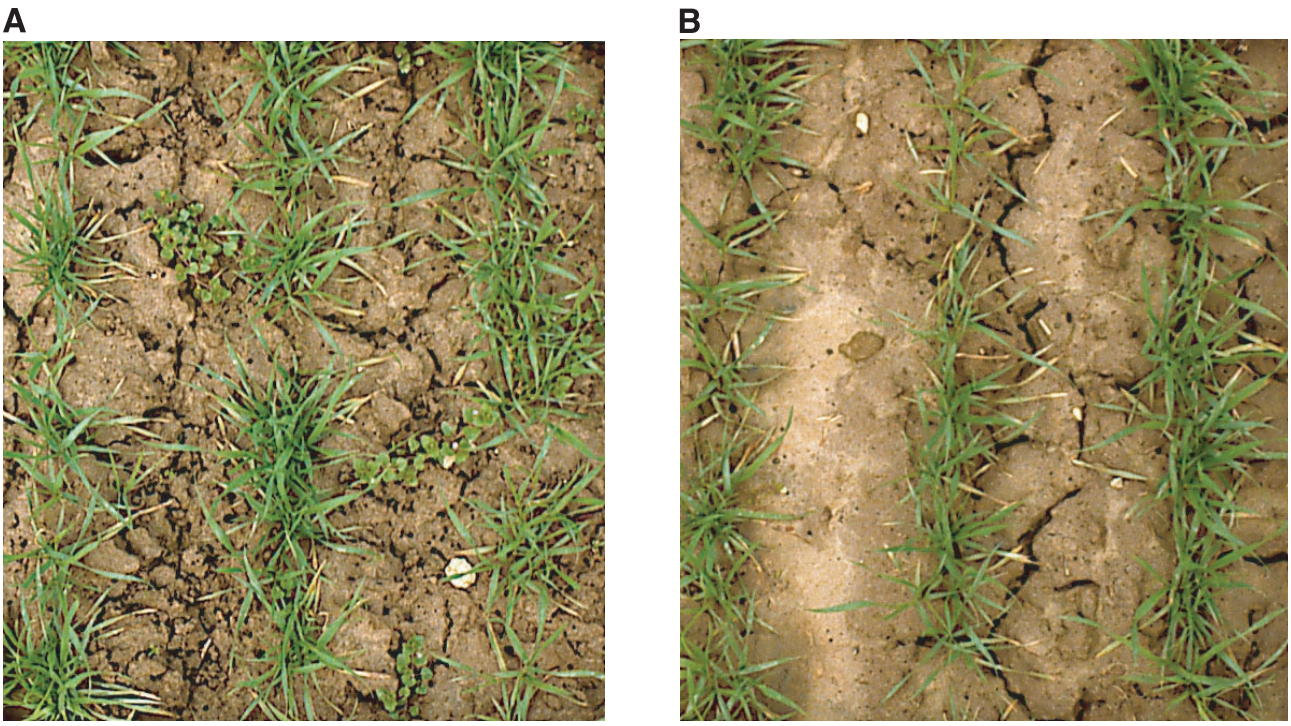


Fig. 3. Biodynamic (**A**) and conventional (**B**) soil surface in winter wheat plots. Earthworm casts and weed seedlings are more frequent in the biodynamic plot. Disaggregation of soil particles in the conventional plots leads to a smoother soil surface. Wheat row distance is 0.167 m. Source: T. Alföldi, Research Institute of Organic Agriculture [Forschungsinstitut für biologischen Landbau (FiBL)].

Champagne Region (chalky subsoil) - Soil Development after 3 Years of Biodynamics

Crop Rotation : Wheat (2010/11), Flax (2011/12), Einkorn (2012/13)

1 Comparison plot (organic)

- without 500 or 500P
- 06-06-2013 : preparation 501

Commentary

- compact structure
- relatively light color
- poor root development
- few olfactory aromas

Enlarge

2 Preparations 500 et 501

- 09-11-2012 : preparation 500
- 24-04-2013 : preparation 500
- 06-06-2013 : preparation 501

Commentaries

- improved soil structure
- darker color
- improved root development
- more olfactory aromas
- some non-decomposed straw

Enlarge

3 Preparations 500P et 501

- 09-11-2012 : preparation 500P
- 24-04-2013 : preparation 500P
- 06-06-2013 : preparation 501

Commentaries

- good porous soil structure
- dark color
- good root development
- rich and refined aromatic smell
- good digestion of straw

Enlarge

Profiles taken on July 30 2013 under very dry conditions

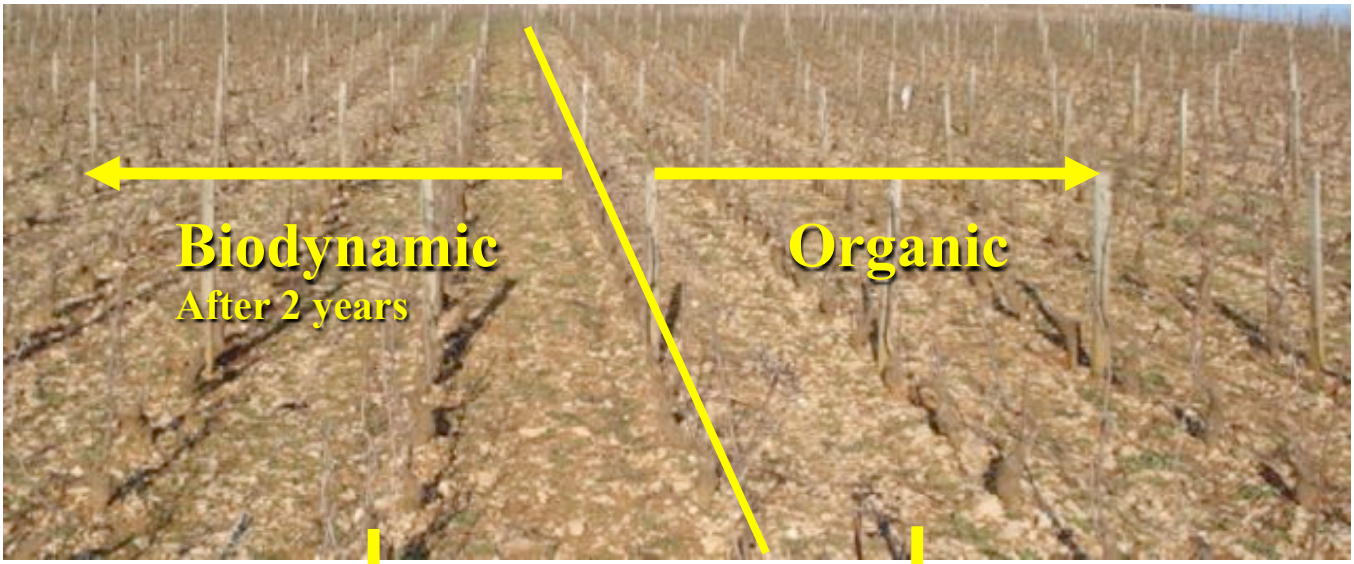
Trial Participants: R. & O. Devalance (Farm Owners), Technical Support : A. Gouez et M. Leclaire, photos A. Gouez

Australian Pastures

Enlarge

Enlarge

Burgundy vineyard



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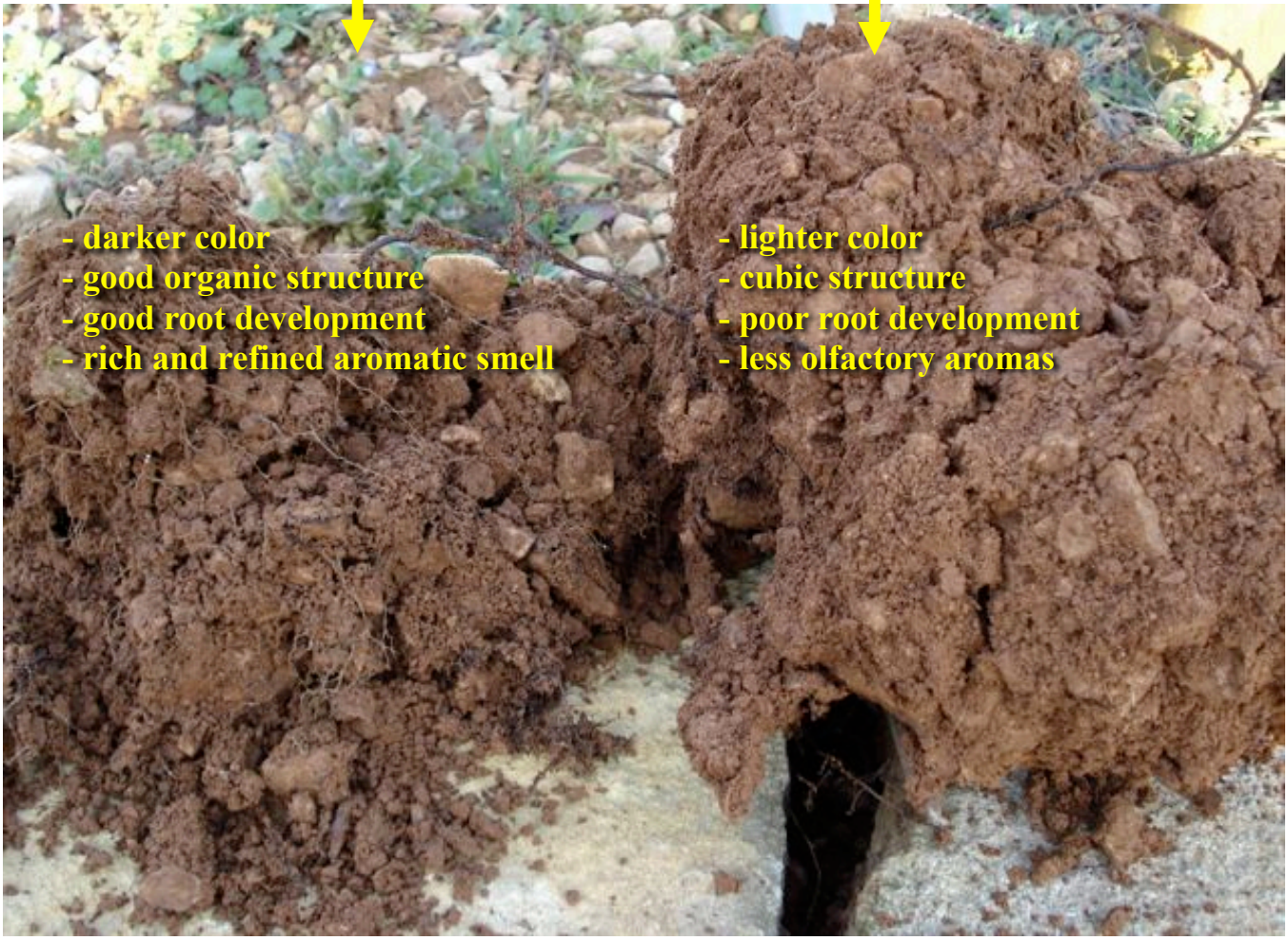


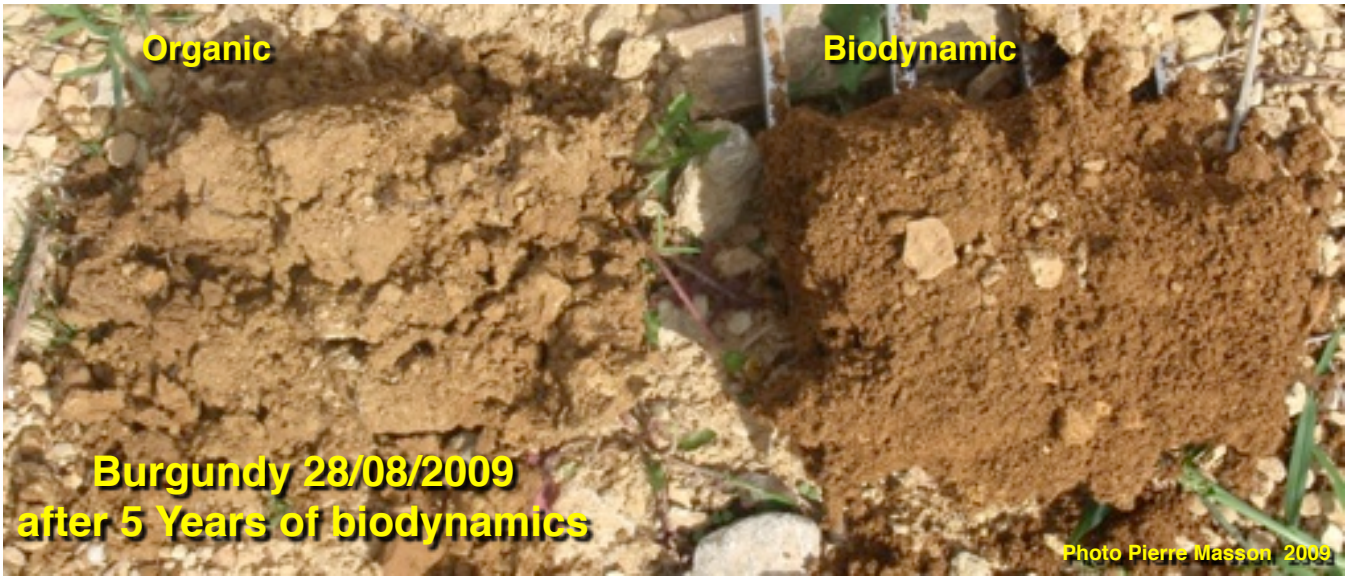
In 2 years the biodynamic plot has received 3 applications of 500 (horn manure - 100g/ha in 40 liters of water and 5 applications of 501 (horn silica - 3g/ha in 40 liters of water)

Photos Pierre Masson 16/02/2007

Profiles of Different Types of Soil

The biodynamic soils have better texture and a darker color (more organic matter)

Enlarge ↑ Enlarge ↓



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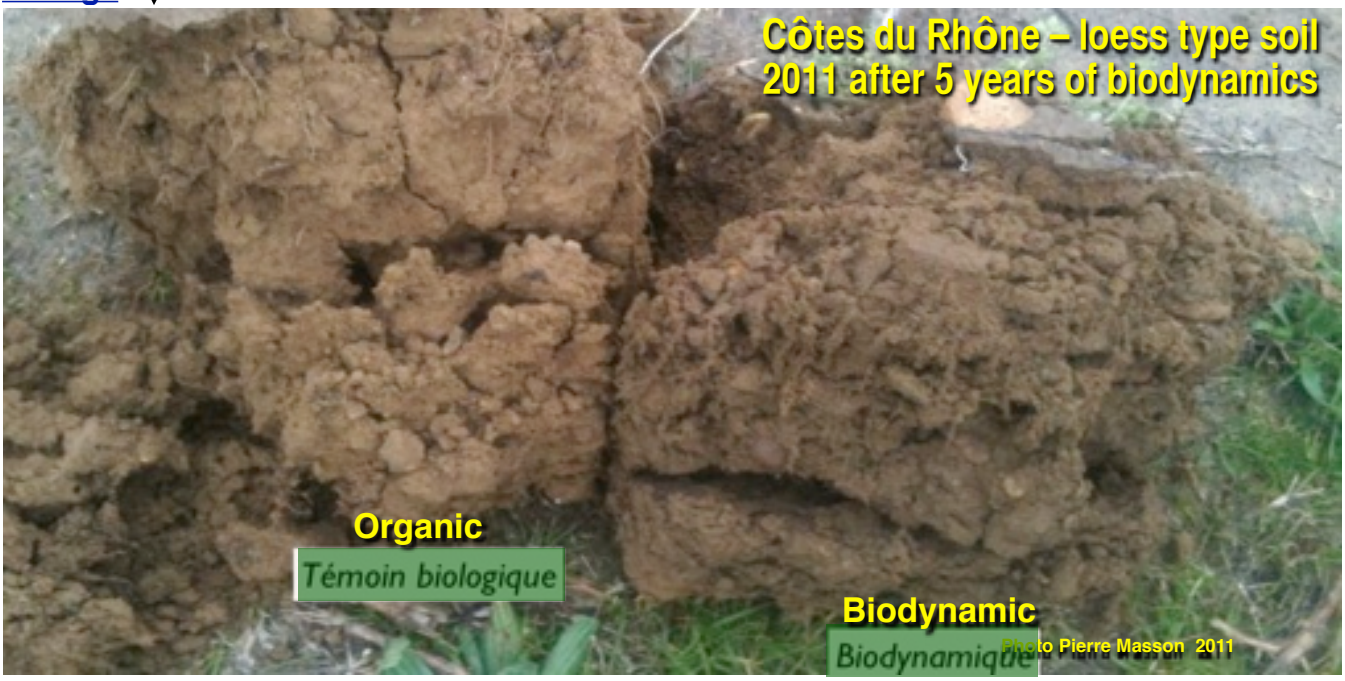

Macon Vineyard

Biodynamic vinyard
weeded mecanically
photo Alex Podolinsky

Enlarge ↑

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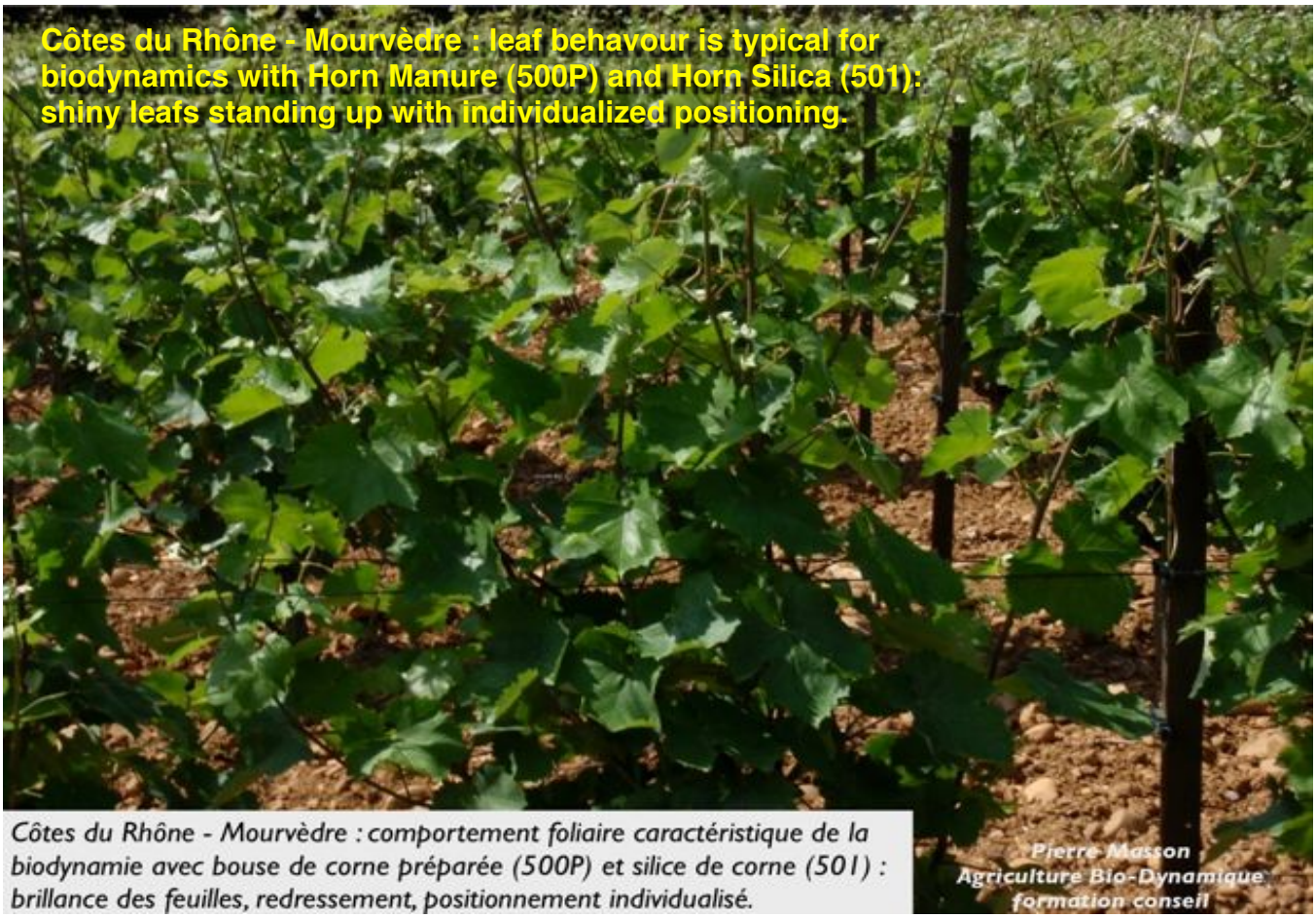
Conventional vineyard 50 m away
chemically weeded with glyphosate
photo Alex Podolinsky

Côtes du Rhône Vineyard



Côtes du Rhône - Mourvèdre : comportement foliaire caractéristique de la biodynamie avec bouse de corne préparée (500P) et silice de corne (501) : brillance des feuilles, redressement, positionnement individualisé.

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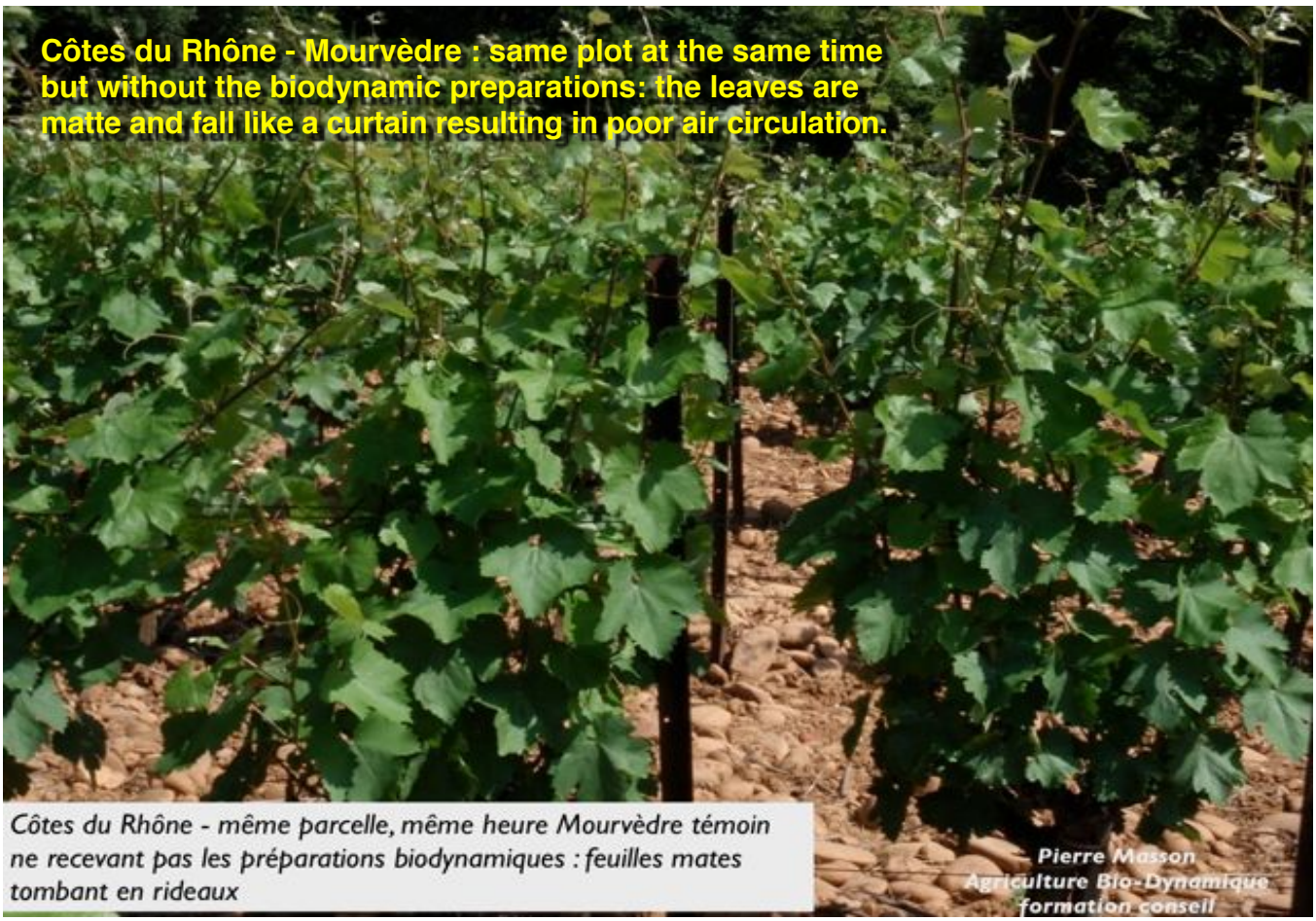


Côtes du Rhône - même parcelle, même heure Mourvèdre témoin ne recevant pas les préparations biodynamiques : feuilles mates tombant en rideaux

Market Garden in Italy

Enlarge

Root development on salad seedlings

On the left: organic (without biodynamic preparations)
On the right: biodynamic with 2 x 500P (prepared Horn Manure) during soil preparation - dipping of naked roots in 500P prior to planting - 1 x 501 (Horn Silica) sprayed on leafs after planting - a second application of 501 will be carried out 2 weeks before harvesting).

photo Adriano Zago 2012

Appendix B

DOK trial– conventional and biodynamic wheat crops

Enlarge

On the left :

Conventional winter wheat fertilized chemically

On the right:

Biodynamic winter wheat without fertilization for 22 years

For 22 years this plot has only received the biodynamic preparations 500 (horn manure) and 501 (horn silica)

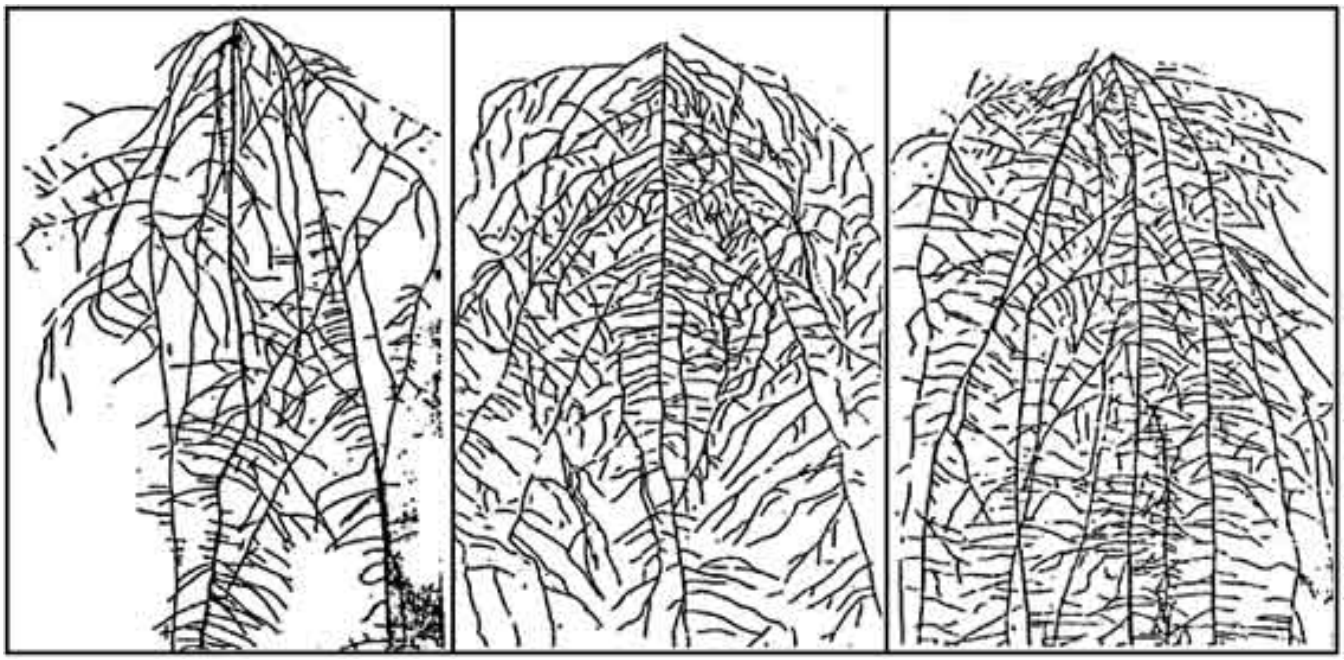
Photo taken by Heini Heer on June 28 2000 at 16h10

Appendix C

The influence of treated and untreated liquid manure on the root development of bush beans (U. Abele 1978)

Untreated manure	Aerated manure with the addition of bentonite	Aerated manure with the addition of bentonite and biodynamic preparations

Depth of 0-40 cm



Depth of 40 80 cm